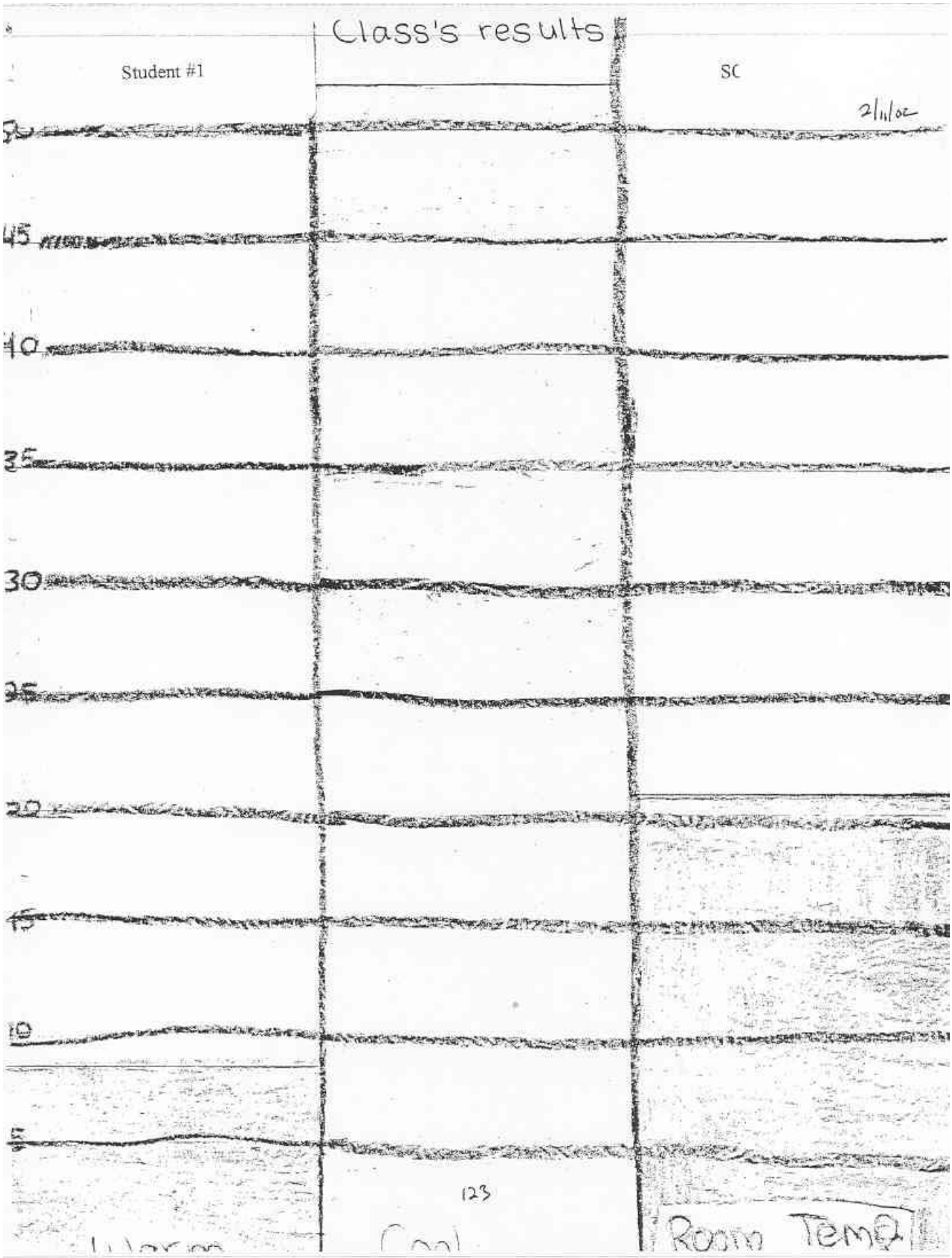
Class's results
Student #1
SC
2/11/02
45
40
35
30
25
20
15
10
5
123
Cool
Room Temp

Student #1

Worm Experiment #3 Grading Rubric

The objective of this experiment was to determine the environmental conditions for vermicomposting.

Question (1 point) **Points Awarded:** 1

0 points: no question stated
1 point: question stated

Hypothesis (1 point) **Points Awarded:** 1

0 points: did not answer question
1 point: answered question

Material (3 points) **Points Awarded:** 3

0 points: did not list materials
1 point: incomplete list of materials
2 points: complete list of materials with no quantities indicated
3 points: complete list of materials with quantities indicated

Directions (6 points) **Points Awarded:** 5

0 points: no directions indicated
2 points: directions are incomplete and disorganized
4 points: directions are generally clear and complete with a minor error or omission
6 points: directions are clear and complete Step #2 needs more clarification.

Data (3 points) **Points Awarded:** 3

0 points: no data reported
1 point: no data table, or the data table is incomplete and disorganized
2 points: data table is generally correct and clearly labeled with a minor error or omission
3 points: data table is well organized and clearly labeled

Results (2 points) **Points Awarded:** 1 +1 Nice graph, but you need to label y axis

0 points: did not include results
1 point: included your own results
2 points: included your own and class results
(Extra point for graphing class or own results)

Conclusion (6 points) **Points Awarded:** 5

A little difficult to follow.

0 points: no conclusion reported
2 point: conclusions are not supported by the experimental data and results, are unclear, disorganized, or illogical
4 points: conclusions are generally clearly stated and supported by experimental data and results, except for a minor error or omission.
6 points: conclusions are clearly stated and supported by the experimental data and results

Format (3 points) **Points Awarded:** 3

Experiment was typed
Organized Lab Format
No larger than 14 pt font
0 points: no
1 point: yes

Overall Points Awarded: 23 out of 25 points

Grade: A-

124

Student # 1

Best Environment for Worm Bins 2/11/02

Experimentation & Research Results:

- Worms like damp soil. ← Are we going to start off with soil?
- Worms prefer dark. ✓
- Worms do come out at night ← How is this useful info?
- The worm bin needs holes so air can get in. Why?
- Need sand so worms can digest food ✓
- Red wrigglers are the best kind. ✓
- Worms can live in temperatures ranging from 85°f-90°f. ← Didn't our research claim worms prefer cool temps? Maybe we need to do more research on this?
- Raise bin for drainage Why? ~~and~~ make holes in
- Plastic bin is best why?
- Add / mist water
- Need to add newspaper / ~~top soil~~ How should it be prepared?
- Newspaper gives air space, helps them breathe, and get to their food

(+) Missing some info! In the future, please add to your notes during the discussion. ✓

· What are you going to feed the worms? How much?

Student Council
468 South Avenue

Dear Student Council:

Hi, I am and I believe it would be an excellent idea to start vermicomposting in our school. Vermicomposting is a great way to help save our earth by not making so much garbage. I know a lot about vermicomposting because in my workshop class we are learning about worms and their fabulous way of eliminating waste. Do you realize how important composting is?

It is important to recycle food waste because food waste builds up garbage. If there were less to throw out, dumps would not be so crowded with garbage. Plus polluting and too much waste is not good for our earth. By having less food waste we are not making as much garbage as we could if we didn't recycle. To help the earth, the composting needs to start someplace, so why not begin in our school?

Our school contains over a 1000 of kids, including staff. Each lunch period 5 or 6 bags of leftover food is thrown away. There are 4 different lunch periods and each lunch period approximately 6 bags are filled with garbage. You do the math; that is 24 big bags of garbage a day. Now that is a lot!! Vermicomposting would start to reduce food waste, providing the school less to throw out since 1 pound of worms can recycle a half a pound a garbage a day.

Composting would also help the community too. It would again reduce waste yet enhance gardens and or improve the soil in . The soil that is produced by the worms, is the food that has been thrown out. s only one dump and over thousands of residents that produce garbage. Even though a small percentage of people do composting, some recycling is better than none. In order to compost, you need to know how to start.

Composting is actually a fairly simple procedure. First you need 2 plastic bins with a lid, newspaper, sand, food waste, and one or more pounds of worms. The best worms are the Red Wrigglers. Then you need to drill holes in the lid and the bottom of one bin. The holes in the lid are for air and the holes in the bottom are for drainage so the worms don't have too much water. You need to shred the newspaper and dampen it, so the worms don't dry out. Shredded newspaper is easier for the worms to move through in order to get to the food. The sand is digested into the gizzard to help grind up food. Then you need to add your food waste. No bones, diary products, or plastics can be composted.

Vermicomposting is a great way to reduce food waste, help the earth, and is very inexpensive. Be assured that the compost will not eminent odors if you do not put on an over abundance of waste. I am telling you it is in your best interest to support

vermicomposting in our school. Think about it. What is the worst it could do? Thank you for your consideration.

Sincerely,

Student #1

Student Council Letter Grading Rubric 3/14/02

The objective of this letter was to persuade the student council to consider (or not) vermicomposting in the cafeteria.

Introduction Paragraph (6 points)

Total Points Awarded: 6

Grabbed the readers interest	0	1	(2)
Included your position on vermicomposting	0	1	(2)
Established credibility to your reader	0	1	(2)

0 points: Did not include information
1 point: Included the information, but weak
2 points: Included the information and met expectation

Body Paragraphs (12 points)

Total Points Awarded: 11

Why is it important (or not) to recycle food waste?	0	1	(2)
What worms are the best composters? How began know which are the best?	0	(1)	2
How can vermicomposting help (or not help) the school?	0	1	(2)
How can vermicomposting help (or not help) the community?	0	1	(2)
What are your recommendations for making a worm bin?	0	1	(2)
Organized your information in the best order that made sense	0	1	(2)

0 points: did not answer the question
1 point: partially answered the question
2 points: sighted specific evidence and examples from research that answered the question that helped prove or illustrate your purpose or main idea.

Conclusion Paragraph (4 points)

Total Points Awarded: 4

0 points: no conclusions made
1 point: conclusion did not support original position
2 points: conclusion weakly supported the original position
3 points: conclusion supported the original position without much persuasion
4 points: conclusion was highly persuasive and supported the original position

Format (3 points)

Total Points Awarded: 3

Letter was typed	0	1
Business Letter Format	0	1
No larger than 14 pt font	0	1

0 points: no
1 point: yes

Overall Points Awarded: 24 out of 25 points

Grade: A Wonderful letter! You've spent a lot of time thinking about the subject!

128

Name: Student #1 Date: 2/13/02 Period: 9

Student #1

43/50 86%

Earthworm Quiz

1. Draw and explain how an earthworm is adapted to moving underground. 4 points -1 -1.5

The worms have setae that help them move along. How? -.5
Also, their segments scrunch and stretch to help them move.

2. Compare how an earthworm senses its environment with how you sense your environment. 10 points

An earthworm tastes it environment with its mouth and The worm can see by cells that only detect light and dark. It hears by vibrations and smell by using other cells in its body. The earthworms touch and feels the ground using its head and body skin. Their brain operates & takes in the info. I see my environment with my eyes, touch by my skin/hands, taste with my mouth, and hear with my ears. The worms see differently, feel dirrently, and hear differently than me. Also taste and smell is different Explain We taste with our mouth -1

3. Would you recommend earthworms for a garden? Compare how a garden would be with and without earthworms. 9 points -1

Yes, I would because the worm's castings are very good for the soil since they contain alot of nutrients. The worms eat up the dead plant and animal matter. Also, the worms create air passageways, so the roots can grow and breathe. A garden without worm would not be so nutrental, the roots might not grow as quickly, plus the soil might contain not so good things for the plant What would the plants look like? -1 ↑ What do you mean by this?

Student #1

4. Do you think vermicomposting is important? Why is it used? 9 points -1

Vermicomposting is important because it saves time and space for building dumps and the garbage that is already contained in the dump. Composting also reduces food waste that is transported to the dump. Less garbage is good for the earth. It is used to reduce food waste and to help the earth. Composting is cheap and doesn't require alot of space.

What can you do with vermicomposted material? -1

5. How would you create a worm bin? Explain why each component is important. 15 points -2

1. Get 2 bins, one for the worms and one for drainage
2. Drill holes in the lid for air and holes in the bottom for drainage. Don't want too much water - why? -.5
3. Shred + dampen newspaper so worms don't dry up and can get to the food easier, and? -.5
4. Add sand, so the worm eats the sand that goes to the gizzard which grinds up food. How much? A lot? A little? -.5
5. Add the worms, red wrigglers are the best.
6. Put the food in so the worm can digest it. ↑ What kind? -.5

6. Assess why some worms in the class worm bin are lacking their clitellum. Predict what is going to happen to the population of worms in the bin. 3 points

What did they become?

The worms are missing their clitellum have mated and the population of the worms are going to increase. Yeah!!

Punk worms

130

Commentary Evaluating Students' Learning

Explain how you and your students used the evaluation criteria and performance expectations for the lab and STS to assess the quality of student learning on each of these two assignments.
Student #1 and I used the evaluation criteria to enhance ideas. Showing knowledge of the subject, Student #1 learned that there needed to be a little more attention to detail. Overall, Student #1's evaluations and expectations for both the lab and the student council letter (STS) showed that expectations were met.

Student #2 and I used the evaluations for the lab and STS in different ways. The lab evaluation with student #1 showed that there needs to be a little more attention to detail when writing up a lab. In the future, I will have to stress the importance of small details. Student #2 met my expectations for the lab. On the other hand, student #2 had a great deal of difficulty with the student council letter (STS). I thought I provided a clear set of directions, but somehow the conclusion was omitted. If there was time, the student would have the chance to redo the assignment paying closer attention to details and directions. In the future, I think I need to pay closer attention to reviewing directions with the class. Somehow I need to make it a little more interactive to keep the students following along so they do not miss any critical directions.

What are the strengths and weaknesses in each student's understanding of science process skills, as evident from the work on the lab?
I think Student #1 is developing an understanding for science process skills. Shown on the worm observation sheet, Student #I is good at making basic observations with some detail, yet shows difficulty with thinking of new questions during observation. Student #1 also demonstrated some difficulty answering basic questions through observation with and without guidance. On the Worm *Observation Lab* sheet, Student #1 had difficulty correcting work because errors were not fixed or details were not added during the class discussion. Student #1 did reveal a good ability with researching and discussing a topic. Carrying out an experiment and making conclusions with data also proved to be a strength. The individual was able to draw conclusions from the results of one's own experiment along with the results of the class. Student #1 was able to apply the knowledge from the three experiments to explain how the worm bin environment should be created.
Student #2 had much more difficulty with making observations and thinking of questions from observations. Student #2's *Wonderful Worm Observation* sheet was incomplete, and I am sure the student had more than enough time to complete that page. There was also difficulty backing up

answers with observations, as illustrated on the *Worm Observation Lab* sheet. Again, the student did not correct or add detail during the class discussion. This makes me think that I needed to stress to the students the importance to writing about their learning. On the other hand, Student #2 demonstrated aptitude for designing and carrying out an experiment with a little difficulty drawing conclusions. Student #2 did not discuss the class results of the experiment in the conclusion. Again, detail and a little more organization would have helped this student.

What are the strengths and weaknesses in each student's understanding of how to apply science knowledge to make decisions about science, technology, and society issues, as evident from the work on the STS?

Writing the letter to student council, Student #1 was able to demonstrate that the processes of science were critical to forming a valid opinion about vermi-composting. Student #1 was able to mix Internet research and experimental research to persuade student council to consider vermi-composting. Student #1 was the leader of the class discussion for the STS, which exemplified her knowledge of being able to discuss the topic.

Researching for Student #2 proved to be a bit more of a challenge. Participating in class discussions also seemed to be a weakness, as noticed while I was watching the video. Much of the information on the "Are *Earthworms the Solution?"* and "*Best Environment for Worm Bins"* sheets was added during the class discussion when the notes were on the board.

Reviewing the student council letter, Student #2 displayed a little more difficulty with supporting ideas with research. Student #2 struggled with establishing credibility for research. A few of the conclusions about vermi-composting, from the Internet research, were a little shallow when it needed to be applied to how it could help the school and community. I think Student #2's lack of enthusiasm for the subject made thinking and writing for this STS an arduous task.

What are the strengths and weaknesses in each student's understanding of the unit's science concepts, as evident from the work on the unit's assessment?

Overall, Student #1 showed a good understanding for the science concepts. Except for a few small details, Student #1 learned a lot about earthworms and their importance. I am pretty sure Student #1 did not draw the earthworm on the quiz because the student did not read the question carefully, not because the student could not draw adaptations. Comparing appeared to be a strength. Student #1 was able to first describe the senses of the earthworm than describe one self s senses. It seems evident

that there was a little trouble with cause and effect relationships. Student #1 had difficulty with thinking about what a plant might look like or be like if it was not effected by earthworms. Also, after making vermi-composted material, Student #1 had some trouble explaining what to do with the material.

Student #1 showed good knowledge for writing the steps of creating a worm bin, yet needed to pay closer attention to detail. Making educated predictions appeared to be a strength. When asked, "What will happen to the population of earthworms, if many of them lack their clitella?" Student #1 was able to accurately respond that the population was going to increase.

Student #2 struggled a bit more with the unit's assessment. She was able to draw but had some difficulty adding detail to explain how earthworms are adapted to moving underground. Comparing oneself to an earthworm appeared to be a simple task for this individual, discussing each sense and how it was similar or different within the same sentence. Again, detail was the weakness. When asked to compare how a garden would be with and without earthworms, Student #2 had difficulty being specific about how a garden would be without earthworms. This individual displayed a solid understanding of the benefits of earthworms in a garden. Justifying an opinion with researched facts was a weakness for Student #2. It was difficult for student #2 to justify the importance of vermi-composting with specific facts. A major fact not discussed in the answer was what waste can be used for vermi-composting to be successful. Writing directions for creating a worm bin also lacked important details. Again, this individual was not thorough about exactly what earthworms eat.

Finally, making an educated prediction with given information proved to be a strength. Student #2 also predicted that the earthworm population was going to increase with the lack of clitella on many worms in the bin.

Reflection on Teaching and Learning

What did you learn about science learning of the entire class during the unit? Use performance patterns identified in the submitted student work to illustrate specific points in your analysis.

At this age I noticed that modeling my expectations guided the students in their learning. Prior to each activity I had to give students examples of how I expected the work to be done. This gave them the structure they needed to promote their own learning. They are not independent enough to devise their own structure; therefore, there is a need for some guidance and reminders. For example, during the first experiment, I gave them a sheet with all of the directions on it. It was very guided. The next day I took some of the scaffolding away and gave the students a sheet with order of the scientific method and had them fill in the blank spaces. The last day of experimentation they were able to develop and carry out their own experiment.

The greatest thing I learned was that my students learn more from discussion for a variety of reasons. First, the discussions clarified many of their ideas. Many of the students came into a discussion being very focused on one idea. When they heard ideas of other students, they were more apt to be able to support or reject their original thought. This was evident during the discussion of the STS research when the students went from thinking vermi-composting was a negative plan to their thinking it was a more positive approach.

Discussions also helped clarify their learning about the topic. At the start of the unit after observing the worms and answering questions, the students still had some misconceptions about earthworms. During the discussion they were corrected. For example, prior to the discussion, many of the students thought the worms had eyes because it looked like the worms were looking at something when they were picking up their heads. The discussion clarified that worms lack eyes and can only sense light and dark, which was an important concept during other lab activities.

The last important observation I made about their learning is that the students struggle with attending to details and correcting their work. In the future I need to spend more time encouraging them to correct and add detail to their work. For example, on the Worm Observation Lab sheet many of the students did not extend their answers after being discussed in class. When I was reviewing the sheet with the class, it appeared that they were correcting their work, but I guess I was wrong.

How did your unit design and instructional strategies support students,' abilities to search for, gather and analyze information from different sources?

During this unit the students used observation, models, experimentation and reading to gather and analyze information. I tried to make the unit as hands on and inquiry based as possible. From the very beginning I wanted the students to feel responsible for their learning. I spent time letting them think of questions they had about worms and observe worms to answer many of those questions. I had them compare worm anatomy to their own so it would make a lot more sense.

I attempted to make this unit somehow apply to the students. Sixth graders are still egocentric about their learning. Instead of just telling the students to research vermi-composting, I made it a student council issue. This empowered the students. They thought there was an important reason for their research, not just to do what the teacher asked.

During that STS research they had a lot of reading material to scan through and find important information. Instead having the students work independently, they worked in groups of four to limit the amount of reading each student had to do. As the students were researching they were discussing and writing their ideas with the small group. This also helped the students that had difficulty with reading for important information.

The discussion of that activity helped the students analyze the information they had gained. They were able to take the information from the research and apply it to how vermi-composting would be positive for the school and community.

Having the students participate in the three experiments to discover the best conditions necessary for a worm bin was also motivating for the students. They had to learn the structure of the scientific method and carry out an experiment. Through the small group discussion, during the experiment, and the large group discussions after each experiment helped the students analyze their data and draw conclusions that would impact the formation of the worm bin.

How can you improve the instructional design and implementation of this unit for a similar group of students in the future? Please be specific and support your ideas with relevant evidence from your portfolio.

There are a few parts to this unit that I want to change when I teach this unit again. The first piece that had trouble fitting the unit was the worm anatomy piece. I don't think it was all that important discussing and explaining the anatomy of the entire worm. There were some critical organs they needed to know about and I should have just focused on those pieces. For example, it was important for the students to know how worms grind their food in the gizzard because sand was needed to be add to the vermi-composting bin. Without that knowledge the students would not know why the sand was added to the bin, and during the final assessment would forget that sand was

needed to create a worm bin. I would also skip the anatomy project and somehow include the important anatomy pieces in an additional more inquiry based lab activity.

For the STS research I would like to provide them with additional resources rather than just relying on the Internet for information. The students found that the Internet information often contradicted itself. I think providing books on the subject and also a video may have helped the students true understanding of vermi-composting. I could tell they had a lot of difficulty realizing the need for recycling programs. In the future I need to explore more activities about recycling in general. These students have not had any experience with this topic because it is not practiced in the school.

I also feel that I left out other important information about vermi-composting like exactly how many worms it would take and how big a bin would be needed to realistically work in the school cafeteria. Another component that needs to be added to this unit is that the red wigglers are not the only living creature in the bins. Many microorganisms move in and aid in the decomposition process.

Another piece I need to change is that I need to show the students how to graph their results and interpret data by using those graphs. In this unit the experimental data can easily be displayed on a graph. Therefore, I need to teach and encourage the process from the very first experiment.

Lastly, I need to find ways to make the classroom discussions much more animated. I need to have the students play a much more physically active role in those discussions to keep them awake and inspired.